



# Enraf Nonius

## Curapuls 670

SERVICE MANUAL





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Copyright:

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## 1 INTRODUCTION

### 1.1 INTRODUCTORY REMARKS

This manual has been written for the technicians involved in the service of the Curapuls 670. Service can be carried out by the service organization of the supplier or by any other technician authorized by Enraf-Nonius B.V.

The manufacturer will not be held responsible for the results of maintenance or repairs by unauthorized persons.

Enraf-Nonius B.V. is further referred to as Enraf-Nonius

#### 1.1.1 Safety Aspects

Safe execution of the procedures in this manual requires technical experience and general knowledge of safety precautions.

Warnings, Cautions and Notes have been used throughout the manual to bring special matters to the immediate attention of the reader.

- The **Warning** concerns danger to the safety of the technician or user;
- The **Caution** draws attention to an action which may damage the equipment;
- The **Note** points out a statement deserving more emphasis than the general text, but which does not deserve a Warning or Caution.

**Warning:** Inside the Curapuls 670 high voltages up to 500V. are present in the channel selection circuit, beware of electrical shock. Do not touch components or heat sinks when the cover is removed.

**Warning:** High power is present in the power amplifier and the 45 volt supply. Short circuit can give high currents.

**Warning:** The HF voltages present in the power amplifier can cause heat sensation and discomfort after long exposure. Adjustment of the coils in the power amplifier can be done by hand, but we advise to use a plastic tool for this purpose.

The sequence of steps in a procedure may also be important from the point of view of personal safety and prevention of damage, therefore never change the sequence of procedural steps or alter a procedure.

#### 1.1.2 Legal Aspects

This manual and the information herein are copyright property of Enraf-Nonius B.V. (Delft, The Netherlands).

Enraf-Nonius B.V. disclaims any responsibility for personal injury and/or damage to equipment caused by:

- Negligence or disregard of a Warning or Caution;

- Deviation from any of the prescribed procedures;
- Execution or activities which are not prescribed;
- Ignorance of the general safety precautions for handling tools and the use of electricity;
- Repairs and/or adjustments made to the equipment with a patient connected.

### 1.1.3 Environmental Aspects

The following materials have been used for construction of the Curapuls 670:

- material: Berillicum oxide ( is toxic, this is found inside the power transistors, do not open the transistor housing)

Please dispose off properly in case of replacement according to the local regulations.

### 1.1.4 Data registration

#### 1.1.4.1 Equipment and customer registration/Service file

From the point of view of safety and product liability the following data must be registered for each unit:

- Equipment data: Type (part) and serial number
- Customer data: Date of delivery of the equipment to the customer, name and full address of the customer
- Configuration file: The actual configuration data of the equipment.
- Service file: Data of all service activities

The distributor as well as their dealer and/or service organization if any, is responsible for these records. They must be able to provide these data when requested.

#### 1.1.4.2 Configuration file

A configuration file gives the serial numbers and/or batch numbers of main sub-assemblies and/or important parts per unit. The parts listed in a configuration file are defined as registered parts. Such are for example parts as transformers, PC Boards, key-boards and software. The registered parts of the Curapuls 670 are marked with a "Y" for "Yes" in the spare parts list in appendix A (column C).

Enraf-Nonius has the original configuration file of each unit. Any possible changes in the original configuration of the supplied units must be filed and the distributor must be able to provide this data. These changes can simply be stored in the service file of the specific unit. Part, serial or batch number(s) of the new parts have to be mentioned.

In case of a claim we expect the distributor to report the claim and the actual configuration data of the equipment in question.



### 1.1.5 Product documentation

The documentation set for the Curapuls 670 also includes an Instruction manual and therapy books. The instruction manual is a recommended item for all service engineers.

Ordering data:

- 1403.751 Instruction manual
- 1403.773 Service manual
- 1419.767 "Shortwave therapy"
- 1419.781 Service manual "Curamed and Curapuls accessories"

Therapy books:

- 1430.761 "Hoogfrequent Electrotherapie met de Curapuls 670" Dutch language
- 1430.762 "Pulsed short wave therapy with the Curapuls 670" English language
- 1430.763 "Pulsed short wave therapy with the Curapuls 670" German language
- 1430.764 "Pulsed short wave therapy with the Curapuls 670" French language
- 1430.765 "Pulsed short wave therapy with the Curapuls 670" Spanish language

### 1.1.6 Installation

For installation of the Curapuls 670 see the Operating Instruction manual.

Also:

- It is not allowed to use this unit in so-called "wet rooms" (hydrotherapy rooms).
- The mains supply connections must comply with the national requirements regarding medical used rooms.
- Before connection of this apparatus to the mains supply, check that the mains voltage and frequency stated on the type plate of this apparatus correspond to that of the mains supply. The 220-240V model is intended for nominal mains voltages of 220, 230 or 240 volt. The 115V model is intended for nominal mains voltages of 110 or 120 volt.
- This apparatus must only be connected to a wall socket with protective earth connection.
- A potential equalisation cable may be connected to this unit if prescribed in the national regulations.

### 1.1.7 Modifications

This publication could include technical inaccuracies or typographical errors. Changes are periodically made to the information herein; these changes will be published as Service Info's in appendix C of this Service Manual.

### 1.1.8 Product evaluation

In order to continuously improve the quality of our products, Enraf-Nonius requests her service organizations to report any structural problem which may be discovered. When the same problem regularly occurs or when safety problems occur, we would like you to send us a product complaint report. The report must contain the name, the type of the

product, a detailed description of the problem, the number of the same problems, quantity of sold equipment and your solution to the problem (if any). The product complaint report can be found as an enclosure in the Service Reference book.

#### 1.1.9 **Additional Information**

Please do not hesitate to contact your National sales organisation or distributor.

For additional information:

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## 1.2 **GENERAL**

The Curapuls 670 is a two channel microprocessor-controlled unit for pulsed shortwave therapy, applied by means of one or two inductive electrodes (Circuplode).

In the Curapuls 670, pulse duration, pulse frequency, power and treatment duration are adjustable. When two electrodes are used, the selected pulse frequency and treatment duration apply to both electrodes, while the other parameters can be set separately for each electrode.

### **Simple and safe operation**

The various parameters are selected by means of push buttons, and are set using one central control knob. Each parameter is shown on a LCD display, giving a good overview of the selected parameters. This is made possible by the application of microprocessor technology. The microprocessor controls and monitors all functions during operation. Directly after switching on, the microprocessor automatically tests the electronics of the Curapuls 670 for safety and correct functioning.

The Curapuls 670 menu can be set in five languages, GB, NL, D, F, E. Changing languages can be done by pressing the "cursor left" key for approx. 2 sec. in the main menu. Changing the language (and other default settings) is done by selecting the option with the "cursor UP or DOWN" keys and rotating the central control.

Pre programmed treatment protocols are available. The treatment protocols are divided in seven sub-selections. In the sub-selection a treatment can be chosen from a list of protocols.

## Optimum energy transfer

Considerable attention has been paid to the way in which the high-frequency energy is transferred to the tissue. Continuous microprocessor-controlled fine tuning ensures optimum adaptation to the tissue characteristics. Special high-output inductive electrodes have been developed for use with the Curapuls 670. These are of the 'Circuplode' type, and are available in small, large and elliptic treatment areas. They are provided with screening for the electrical field so that only a magnetic field\* is created.

\* a pure angular electric/electromagnetic field

The type of electrode (large/small/elliptic) connected to each channel is recognized automatically, eliminating the chance of incorrect settings. If the load on the electrode is insufficient, no power will be supplied. This is indicated by a flashing LED on the electrode. This form of power transfer indication prevents inefficient treatment, thus contributing to optimum treatment results.

If treatment on a small part of the body (e.g. the wrist, ankle) is to be done, exact placement of the Circuplode is of greatest importance for beneficial treatment. In some cases treatment with a standard Circuplode will not be possible making it necessary to connect a small Circuplode.

The Curapuls 670 has been designed and manufactured to ensure the highest level of safety; the unit fully complies with the IEC 601 series safety standards.

## 1.3 TECHNICAL DATA

### 1.3.1 General

Mains supply	: 110-120 VAC, 220-240 VAC
Permissible mains voltage var.	: $\pm 10\%$ (220-240 V)
Mains frequency	: 50-60 Hz
Current consumption	: max. 3.5 A at 115 V
	: max. 1.6 A at 230 V (220-240 V)
Mains fuses	: 2 x F 6.3 A 250 V (F, mains entrance)
Internal fuses	: T 1A (F1, 18.5V supply)
	: T 3.15A (F2, 12V supply)
	: T 3.15A (F3, 18.5V supply)
	: T 50mA (F4, 160V supply)
	: T 20A (F5, 24V supply)
Patient leakage current	: typical 2 $\mu$ A (IEC requirement $\leq 100 \mu$ A)
Ditto, single fault condition	: typical 2 $\mu$ A (IEC requirement $\leq 500 \mu$ A)
Earth leakage current	: typical 250 $\mu$ A (IEC requirement $\leq 500 \mu$ A)
Ditto, single fault condition	: typical 450 $\mu$ A (IEC requirement $\leq 1000 \mu$ A)
Earth resistance	: 0.03 $\Omega$ (typical) (IEC601 requirement $\leq 0.2 \Omega$ )
Safety class	: I <sup>1)</sup> type BF <sup>2)</sup>
Safety approval	: GS Test Mark of TÜV Rheinland <sup>3)</sup>
Radio interference suppression	: EN60601-1-2
	: EN50082-2
	: EN61000-3-2
Dimensions	: 39 x 40 x 93 cm
Weight	: 45 kg (excluding arm)

Colour specification : EN Custom colours

- <sup>1)</sup> I: The equipment has a safety earth (ground) connection, and must be connected to a wall socket with protective earth connection.
- <sup>2)</sup> BF: The equipment has a floating patient circuit. The Curapuls 670 meets the requirements of IEC 601 series safety standards.
- <sup>3)</sup> Copies of certificates or certificates of conformity (COC) are available on request.

### 1.3.2 European union:

Marking : CE <sup>4)</sup>



- <sup>4)</sup> This equipment complies with all requirements of the Medical Device Directive (93/42/EEC) and with EMC Guideline 89/336/EEC.

### 1.3.3 Shortwave therapy

Shortwave frequencies	: 27.12 MHz $\pm$ 0,6 %
Channels	: 2
Output pulse duration	: 65, 82, 110, 150, 200, 300, 400 $\mu$ s ( $\pm$ 5%)
Pulse frequency	: 26, 35, 46, 62, 82, 110, 150, 200, 300, 400, 600 and 800 Hz ( $\pm$ 5%) (600 and 800 Hz Circuplode E only, single use)
Pulse power	: 0 - 200 W ( $\pm$ 20%) in steps of 5W into 50 $\Omega$
Mean power	: 0 - 64 W (48 and 64 W Circuplode E only) into 50 $\Omega$
Contact control threshold level	: 80 % of initial value
Timer	: 0 - 30 minutes ( $\pm$ 5%)

## 2 DESCRIPTION

Because of the modular construction of the Curapuls 670 the description is done in module level. The modules can be found in the block diagram.

### 2.1 BLOCK DIAGRAM (see appendix B fig. 1)

The electronic circuit of the Curapuls 670 is located on 2 modules:

- Application module HF. (also referred to as main PC Board).
- User interface module (also referred to as user interface PC Board) including LCD parameter display with backlighting.

Input power and output power devices:

- Mains supply circuit
- Circuplode(s)

#### 2.1.1 Application module HF. (main PC Board)

The function of the application module is to generate the shortwave output power as specified for the Curapuls 670.

The application module comprises the following circuits:

- AC/DC power supply circuits.
- Fuses
- Processor circuits ( $\mu$ P)
- Program memory
- Analogue to digital (AD) and digital to analogue (DA) converters
- Timer circuits,
- VCO circuit
- Measuring circuits
- Monitoring/safety circuits.
- Driver and output stages

#### Description of the application module:

The functions of the Curapuls 670 are controlled by the microprocessor ( $\mu$ P). The  $\mu$ P gathers information about connected electrodes (which type, which channel) and about the set parameters (pulse duration, pulse frequency, treatment time, intensity etc.). The software used for these functions is stored in EPROM. Timer circuits are used for generating treatment parameters and for measuring the output signals. Safety circuits are applied for checking the safe operation of the Curapuls 670, also is checked that the output does not exceed maximum values. All signals are generated by the  $\mu$ P and converted by a DA converter to analogue signals. These signals are measured and converted by a AD converter. This signal is fed back to the  $\mu$ P for comparison with the set parameters and the output is corrected if necessary. The Voltage Controlled Oscillator (VCO) is also checked for the output frequency which is 27.12 MHz ( $\pm 0.6\%$ ). The driver and output stages generate the output as specified for the Curapuls 670.

### 2.1.2 **User interface module** (user interface PC Board)

The user interface module enables communication between the application module and all user controls and display (parameter selection keys and parameter control).

The user Interface module comprises the following circuits:

- Processor circuit ( $\mu$ P)
- Program memory
- LCD display
- LCD display back light inverter
- Indication LED
- Parameter selection keys
- Amplitude/parameter control
- Buzzer

#### **Description of the user interface module:**

All treatment parameter settings and user actions are checked by the  $\mu$ P and program memory. The selection switches at the front panel and information from the central control knob are scanned by the  $\mu$ P. Also the user actions and the sequence of the actions are checked before these are executed. The therapy settings are send to the application module. The parameter settings and treatment time are displayed on the LCD display .

### 2.1.3 **Mains supply circuit**

The mains power is fed into the Curapuls 670 via a mains entrance. Inside the mains entrance two mains fuses are found. The mains power runs via a mains filter and a mains switch to the primary side of the mains transformer. The mains power is transformed into 12V, 18.5V, 18.5V, 24V and 160V and fed into the power supply section of the main PC Board.

### 2.1.4 **Circuplode(s)**

To transmit the HF. power into a patient Circuplodes are used. Available Circuplodes are Circuplode diam. 90mm, Circuplode diam. 140mm and the Circuplode-E (ellipse shaped).

### **3 TEST EQUIPMENT AND TOOLS**

#### **3.1 TEST EQUIPMENT**

For the repair and maintenance procedures of the Curapuls 670 the following test equipment and accessories are required:

- Digital multimeter 3 1/2 digit, accuracy better than 1 %. (2x) For example Fluke 77
- Two beam oscilloscope, >30MHz, accuracy better than 5%. For example Philips PM 3055
- Safety tester according IEC 601-1. For example a Biotek 601 PRO safety tester
- Universal frequency counter 30 MHz. For example Thandar TF 200

#### **3.2 TOOLS AND MATERIALS**

It is assumed that a complete set of precision engineering tools is available. For the service of the Curapuls 670 the following additional tools are required:

- Anti-static bench mat with earthing wire and wrist strap
- Tool for removal of Dual In Line (DIL) integrated circuits, 0.6"
- Dummy load 50  $\Omega$  (2x for burn-in test) Par. No. 0403.801
- Curapuls 403/670 HF power meter Part No. 0403.803
- Coax cable length 0.60 m. 50  $\Omega$
- Coax cable length 1.50 m. 50  $\Omega$  (2x for burn-in test)
- Miniature screw driver (trim screwdriver), blade 1.4mm.





## **4 MAINTENANCE**

### **4.1 GENERAL**

We recommend to check the Curapuls 670 annually.

### **4.2 CHECKLIST**

The following procedures must be carried out during an inspection and/or after every repair:

- 4.2.1 Modifications, if any, according to the "Service Info" sheets. See appendix C of this manual for further information.
- 4.2.2 Visual inspection. Check the electrical wiring for safety and check that all components are properly fastened. Check that the fuses have the specified ratings (see par. 1.3.1).
- 4.2.3 Check that all accessories are in good condition.
- 4.2.4 Functional test (see chapter 4.3).
- 4.2.5 File all service activities.

### **4.3 FUNCTIONAL TEST**

#### **4.3.1 Self test**

Connect the Curapuls 670 to the mains and switch on the equipment.

The Curapuls 670 will carry out the so-called self test for approx. 10 seconds. At the end the buzzer sounds (otherwise see par. 4.4.1.2 - 4 ). It is assumed that when the selftest is passed all functions of the Curapuls 670 are okay.

Switch off the Curapuls 670.

#### **4.3.2 Control panel test**

Push and hold depressed the two right-hand switches (enter and start/stop keys) at control panel simultaneously, during switching on the Curapuls 670 on (see appendix B, fig. 2).

Release the switches after the "beep".

Check the switches one by one; each time the buzzer sounds, the switch which is depressed is shown in the LCD display (otherwise see par. 4.4.1.6).

Check the central control knob, rotating clockwise will move a rectangle from left to right between the two lines at the bottom of the LCD display. Rotating anti-clockwise will

move a rectangle right to left between the two lines at the bottom of the LCD display (otherwise see par. 4.4.1.7).

### Entering the service mode:

Testing of other parts of the Curapuls 670 is done in the so called "SERVICE MODE". For starting the service mode enter the following key code when in control panel test mode, press in sequential order the following keys:

2 x cursor up key,  
1 x enter key,  
1 x cursor down key,  
2 x cursor right key.

After entering this code the Curapuls 670 is in service mode. The following options are displayed:

Test number	:	test number of the test for the Curapuls 670.
Sub-selection	:	test sub-selection if available.
Result hex.	:	test results in hex. if relevant.
Result dec.	:	test results in dec. if relevant.

**Note:** Only the tests which are relevant for the functional test are shown below, other tests are used during production, for diagnostic purposes or used for adjustment/calibration (see par. 4.6).

Selection of a test number is done by rotating the central control. To start a test press the start/stop key. When a test is executed the green LED above the start/stop key will light. Stop a test by pressing the start/stop key again. During execution of a test the test number can not be changed, first stop a test before changing to an other test.

**Note:** Leaving the service mode is done by switching off the Curapuls 670.

#### 4.3.3 Main board software version number

Enter the service mode and select test 36

To display the application software version press the start/stop key.

The displayed version is A4 or higher (A = application software Curapuls 670, 4 = version number).

Stop the test by pressing the start/stop key.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.4 User interface / language software version number

Enter the service mode and select test 53

The language software version is displayed at "Result hex" on the display.

The user interface software version is displayed a "Result dec" on the display.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.5 **Display test**

Enter the service mode and select test 50

To enter the display test press the start/stop key.

An alternating block-pattern is displayed. Check that no pixels are missing in normal or inverted mode.

Stop the display test by pressing the start/stop key.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.6 **Watchdog circuit test**

Enter the service mode and select test 51

To enter the display watchdog circuit test press the start/stop key.

An error is generated in the watchdog circuit. When an error is found the beeper sounds alternately and the display will show:

```
SYSTEM ERROR
      043
Main board Error
      03
```

Switch off the Curapuls 670 and continue with the next test by entering the service mode.

#### 4.3.7 **Formatting the EEPROM**

Enter the service mode and select test 52

To enter the formatting of the EEPROM press the start/stop key.

During formatting the buzzer sounds.

When the buzzer stops continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.8 **Circuplode identification test**

Enter the service mode and select test 10

Connect a Circuplode to channel A of the Curapuls 670. To enter the identification test press the start/stop key.

Result hex. display:

00	No Circuplode connected
01	200 Watt Circuplode
02	150 Watt Circuplode
03	100 Watt Circuplode
04	200 Watt / 800 Hz Circuplode E

05	dummy load
06	short circuit

Stop the identification test by pressing the start/stop key.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.9 Safety relay test

Enter the service mode and select test 11

This test controls the safety relay and switches it on and off with a frequency of 1 Hz. The functioning of the relay can be heard by the click-sound inside the housing (see appendix B, fig. 7). By using a multimeter (DCV) the proper working can be checked at TP34 (GND) and TP16.

Stop the safety relay test by pressing the start/stop key.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.10 Channel A function test

Enter the service mode and select test 26

This test generates a low power pulse of 400 us and 100Hz in the output stage. All circuits are working as in the normal condition, enabling to measure various signals. Also the frequency is controlled to the resonance frequency. Connect a Circuplode to Curapuls 670.

The power Result dec. display reads the SWR (ratio Forward / Unreflected).

A good SWR is less than 55H.

The sub-selection numbers are:

Sub-selection: 0	0 Watt	more than 55H (unloaded)
1	5 Watt	less than 55H (loaded)
2	10 Watt	"
3	15 Watt	"
4	20 Watt	"

When an incorrect SWR value is displayed see par. 4.4.1.8

Stop the channel A function test by pressing the start/stop key.

Continue with the next test or leave the service mode by switching off the Curapuls 670.

#### 4.3.11 Channel B function test

Enter the service mode and select test 27

This test generates a low power pulse of 400 us and 100Hz in the output stage. All circuits are working as in the normal condition, enabling to measure various signals. Also the frequency is controlled to the resonance frequency.

Connect a Circuplode to Curapuls 670.

The power Result dec. display reads the SWR (ratio Forward / Unreflected).

A good SWR is less than 55H.  
The sub-selection numbers are:

Sub-selection: 0	0 Watt	more than 55H (unloaded)
1	5 Watt	less than 55H (loaded)
2	10 Watt	"
3	15 Watt	"
4	20 Watt	"

When an incorrect SWR value is displayed see par. 4.4.1.8

Stop the channel B function test by pressing the start/stop key.  
Leave the service mode by switching off the Curapuls 670.

#### **FUNCTIONAL TESTS IN OPERATING MODE:**

The next tests are done in operating mode. To end the service mode switch off the Curapuls 670. Switch on the Curapuls 670 and wait until the selftest is ended. Select Treatment parameters in the MAIN MENU.

##### **4.3.12 Channel A Circuplode detection.**

Connect a Circuplode to output channel A.  
Check that treatment parameters are displayed at the left side of the LCD display (Circuplode detected).  
Disconnect the Circuplode, the treatment parameters will blank (Circuplode not detected). Check the connections by moving the cable.

##### **4.3.13 Contact indication channel A**

Check functioning of contact indication with all available Circuplodes.  
Connect a Circuplode to channel A.  
Increase the output power to approx. 25 Watt and set treatment time. Start the treatment by pressing the Start/stop key. Check the functioning of the contact indication LED on the Circuplode. When no load is detected the LED will blink and the buzzer is beeping. When a load is detected the LED lights and the buzzer stops (otherwise see par. 4.4.1.9).

##### **4.3.14 Channel B Circuplode detection.**

Connect a Circuplode to output channel B.  
Check that treatment parameters are displayed at the left side of the LCD display (Circuplode detected).  
Disconnect the Circuplode, the treatment parameters will blank (Circuplode not detected). Check the connections by moving the cable.

##### **4.3.15 Contact indication channel B**

Check functioning of contact indication with all available Circuplodes.

Connect a Circuplode to channel B.

Increase the output power to approx. 25 Watt and set treatment time. Start the treatment by pressing the Start/stop key. Check the functioning of the contact indication LED on the Circuplode. When no load is detected the LED will blink and the buzzer is beeping. When a load is detected the LED lights and the buzzer stops (otherwise see par. 4.4.1.9).

#### 4.3.16 Output power

Check the power using the Curapuls 670 power meter and 50 ohms dummy in combination with a voltmeter.

Connect the power meter and dummy to channel A.

Connect the voltmeter to the banana type plugs.

Set maximum power for channel A. Set treatment time and start treatment. The voltmeter should read 2.00 volt  $\pm$  0.1 Volt (otherwise see par. 4.6.4).

#### 4.3.17 Safety tests

Check the resistance of the earth connection (see technical data).

Check the earth leakage current in normal condition (N.C.) as well as in the single fault condition (S.F.C.) (see technical data).

### 4.4 TROUBLE SHOOTING

#### 4.4.1 Trouble shooting list

Failure indication:	Action to be taken:
4.4.1.1 Curapuls 670 does not switch on; LCD display fails to light, no text is displayed, no selftest	<ol style="list-style-type: none"> <li>1. Check mains power supply</li> <li>2. Check/replace mains cable</li> <li>3. Check/replace mains fuses</li> <li>4. Check/replace mains switch</li> <li>5. Check/replace main PC Board fuse(s) (F2)</li> <li>6. Check connections between main PC Board and user interface PC Board</li> <li>7. Perform power supply check, see par. 4.6.1</li> <li>8. Check/replace wiring</li> <li>9. Check/replace transformer</li> </ol>
4.4.1.2 Selftest fails	<ol style="list-style-type: none"> <li>1. Check/replace main PC Board</li> <li>2. Check/replace user interface PC Board</li> <li>3. Check/replace main PC Board fuse(s)</li> </ol>
4.4.1.3 Curapuls 670 LCD display fails to light, no text is displayed, beep after selftest	<ol style="list-style-type: none"> <li>1. Check connection display backlighting</li> <li>2. Check/replace display back light PC Board</li> <li>3. Check/replace LCD display module</li> </ol>
4.4.1.4 Curapuls 670 LCD display back light OK, no text is displayed	<ol style="list-style-type: none"> <li>1. Check/replace EPROM(S) on user interface PC Board</li> </ol>

- |  |  |
|--|--|
|  | 2. Check/replace user interface PC Board   |
| 4.4.1.5 Curapuls 670 LCD display no back light, text (low contrast) is displayed | 1. Check/replace wiring between main PC Board and display PC Board<br>2. Check/replace display back light PC Board   |
| 4.4.1.6 Control panel test (selection keys) fails                                | 1. Check/replace switch<br>2. Check/replace user interface PC Board  |
| 4.4.1.7 Control panel test (central control rotary switch)                       | 1. Check/replace rotary switch<br>2. Check/replace user interface PC Board   |
| 4.4.1.8 Incorrect SWR value channel A/B function test                            | 1. Check/adjust Circuplode, see par. 4.6.5 for adjustment procedure.<br>2. Check/replace main PC Board   |
| 4.4.1.9 Circuplode contact indication fails                                      | 1. Check with other Circuplode for correct operating of the Curapuls unit, if not see par. 4.6.3 and 4.6.4 for adjustment procedure.<br>2. Check/adjust/replace Circuplode, see par. 4.6.5 for adjustment procedure.<br>3. Check/replace main PC Board |
| 4.4.1.10 Safety test fails   | 1. Check/replace wiring<br>2. Check/replace transformer<br>3. Replace main PC Board  |

#### 4.4.2 Error codes

The Curapuls 670 is continuously checked for correct operation by the software. If malfunctioning is detected an error message is displayed. These error codes can be generated when starting up (during selftest) or during operation. An error message is indicated by an audio signal and an error code on the LCD display of the Curapuls 670.

#### 4.4.3 Error code list

Error code numbers which can be generated are from 0 up to 67. Most error codes which are generated are meant for repair by Enraf-Nonius Technical Service Support dept. **Other codes than explained below are NOT meant for repair by field service engineers.** For repair of these errors detailed information and/or special tools or equipment are required.

##### Error code / description:

##### Action to be taken:

043 communication error 11  
(+12V. supply error)

- Check 18.5V. (transformer conn. E-F)  
- Check/replace fuse F3

043 communication error 12  
(-12V. supply error)

- Check 18.5V. (transformer conn. G-H)  
- Check/replace fuse F1

043	communication error 13 (+15V. supply error)	<ul style="list-style-type: none"><li>- Check 18.5V. (transformer conn. G-H)</li><li>- Check/replace fuse F1</li><li>- Check 18.5V. (transformer conn. E-F)</li><li>- Check/replace fuse F3</li><li>- Check 160V. (transformer conn. I-J)</li><li>- Check/replace fuse F4</li></ul>
043	communication error 14 (+300V supply error)	<ul style="list-style-type: none"><li>- Check 160V. (transformer conn. I-J)</li><li>- Check/replace fuse F4</li></ul>
043	communication error 56 (+45V. supply error)	<ul style="list-style-type: none"><li>- Check 24V. (transformer conn. A-B)</li><li>- Check/replace fuse F5</li></ul>
043	Watchdog error 03	<ul style="list-style-type: none"><li>- Replace Main PC Board</li></ul>
043	communication error 57 (+45V. supply error)	<ul style="list-style-type: none"><li>- Check 24V. (transformer conn. A-B)</li><li>- Check/replace fuse F5</li></ul>
043	Main board error 34 (Output frequency to low)	<ul style="list-style-type: none"><li>- Check/adjust output frequency (see par. 4.6.3)</li></ul>
043	Main board error 34 (Output frequency to high)	<ul style="list-style-type: none"><li>- Check/adjust output frequency (see par. 4.6.3)</li></ul>
045	memory error: EEPROM	<ul style="list-style-type: none"><li>- Check connections between main PC Board and user interface PC Board</li><li>- Perform EEPROM format, see par. 4.6.2</li></ul>

## 4.5 REPLACEMENT PROCEDURES

### 4.5.1 General

When handling static sensitive devices such as the PC Boards of the Curapuls 670 the following precautions should be observed:

- Persons should be earthed by means of a wrist strap
- Ground all electrical equipment, work-bench, soldering iron etc.

After every repair or adjustment of the Main board, a functional test must be performed (see par. 4.3).

**Warning:** Inside the Curapuls 670 high voltages are present, beware of electrical shock. Do not touch components or heat sinks when the cover is removed.

### 4.5.2 Front cover

*Removal:* Switch off the unit and remove the mains cable from the mains entrance. Remove the screws on both sides of the metal strip between top- and front cover. Remove the metal strip. Remove the two screws of the front cover. Remove the front cover by lifting it from the chassis.



*Installation:* Installation of the front cover is in reverse order of the removal procedure.

#### 4.5.3 Top cover

*Removal:* Remove the front cover (see par. 4.5.2). Remove the four screws at the top at the inside of the housing. Disconnect the cables from CN1 and CN2 from the main PC Board. Lift the top cover carefully, disconnect the mains switch if necessary. Remove the top cover.

*Installation:* Installation of the top cover is in reverse order of the removal procedure.

#### 4.5.4 Main PC Board

*Removal:* See par. 4.5.2 for removal of the front cover. Disconnect the coaxial cables from output channels A (CN5) and B (CN4) and from connectors CN1, CN2, CN3 CN8, CN11. Remove the 10 mounting screws.

*Installation:* Installation of the main PC Board is in reverse order of the removal procedure.

**Caution:** Check that all fuses have the correct value (see par. 1.3.1)

**Note:** Check when mounting the main PC Board for the right version software (version 4 or above) of EPROM IC1, see appendix B, fig. 5.

**Note:** When inserting the EPROM with the application software into the socket, the PC Board must be supported to ensure that no components will be damaged by mechanical force.

**Note:** Check that jumper ST1 is removed.

#### 4.5.5 User interface PC Board

*Removal:* See par. 4.5.2 for removal of the front cover, and par. 4.5.3 for removal of the top cover. Remove the mounting screws. Remove the user interface / LCD display module- assembly. For removal of the LCD display see par. 4.5.6.

*Installation:* Installation of the user interface PC Board is in reverse order of the removal procedure.

**Note:** When inserting the EPROM with the control / language software into the socket, the PC Board must be supported to ensure that no components will be damaged by mechanical force.

#### 4.5.6 LCD display module

*Removal:* See par. 4.5.5 for removal of the user interface PC Board. Disconnect

the display back light connector (CN4 or CN6 depending on type of display). Remove the mounting screws. Remove the user LCD display.

*Installation:* Installation of the LCD display PC Board is in reverse order of the removal procedure.

#### 4.5.7 Mains transformer

*Removal:* See par. 4.5.2 for removal of front cover. Disconnect the wiring from the transformer. The removal of the mains transformer needs no further explanation.

*Installation:* Installation of the mains transformer is in reverse order of the removal procedure.

**Note:** For wiring of the mains transformer see appendix B, fig. 9.

### 4.6 ADJUSTMENT PROCEDURES

The adjustment procedure for the Curapuls 670 is carried out under the following test conditions:

- The mains voltage must correspond with the technical specifications of the Curapuls 670
- The ambient temperature must be  $25^{\circ}\text{C} \pm 5^{\circ}\text{C}$

After any repair and or maintenance, check:

- a) the mains wiring and grounding for safety,
- b) the earth connection resistance,
- c) the earth leakage current, both in the normal and in the single fault condition according to the I.E.C. 601 regulations regarding class I, type BF equipment.
- Check that the fuses have the ratings specified.
- Check that all connectors are properly fastened.
- Check that the test jumper is at home position ST1 (pushed on one of the pins, but not closed).

#### 4.6.1 Power supply check

Switch on the mains and check the following supply voltages with respect to ground (TP31, TP32, TP33, TP34), see appendix B, fig. 7 for location of the measuring points.

Volt	Tolerance (%)	measure at
+8V	5	C2
+5V	5	C12
+12V	5	C27
+15V	5	C34
-12V	5	C44

+430V	15	C80
+45V	5	C134
+15V	5	IC38

#### 4.6.2 Formatting the EEPROM

Enter the service mode, see par. 4.3.2 and select test 52 (par. 4.3.7)

To enter the formatting of the EEPROM press the start/stop key.  
During formatting the buzzer sounds.

When the buzzer stops the formatting process is ended, leave the service mode by switching off the Curapuls 670.

#### Adjustments

For adjustments of power and frequency range the following is required:

- Dummy load (50 Ohms) (2x for burn-in test) (see par. 3.2)
- Curapuls 670 power meter (see par. 3.2)
- Coax cable length 0.60 m. 50  $\Omega$
- Coax cable length 1.50 m. 50  $\Omega$  (2x for burn-in test)
- miniature screw driver, blade 1.4 mm
- universal frequency counter 30 MHz.
- amperemeter (multimeter)
- voltmeter (multimeter)

**Note:** After a repair or adjustment of the main PC Board a burn-in test is recommended for testing of the proper functioning of the Curapuls 670.

#### 4.6.3 Adjustment Voltage Controlled Oscillator (test 37)

- Select test 37, par. 4.6.3 (see par. 4.3.2 for entering the service mode).  
The result hex. and result dec. on the display read the VCO frequency.

For example: Result dec. 27.30

Frequency of the VCO is 27.30 MHz.

- Calibrate with L3 to 27.12 Mhz. See appendix B, fig. 8 for location of L3.  
(Calibrate only if frequency is more than 27.20 or if less than 27.00)

Checking of the VCO frequency is done by connecting a frequency counter to TP10 (signal) see appendix B, fig 8 and TP32 (GND) see appendix B, fig. 7.

#### 4.6.4 Power adjustment output stage (test 38)

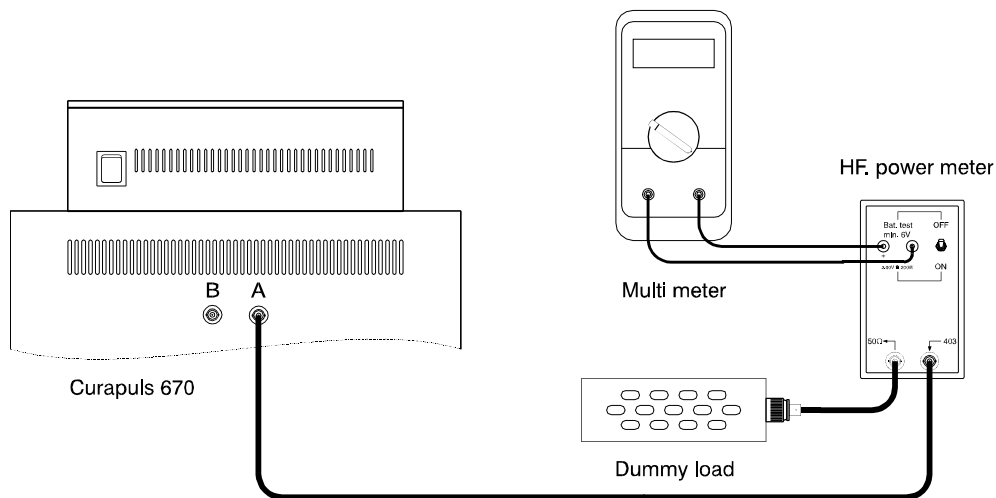


fig. A Connection of the power meter and 50  $\Omega$  dummy load

Explanation of the displayed values during test 38:

Result hex. display:

- |   |   |
|---|---|
| 0 | No overload, adjustment can be performed                      |
| 1 | overload  |
| 2 | no dummy connected  |
| 3 | fault detected in seftest                                     |
| 4 | SWR in channel A not good (check dummy load for 50 $\Omega$ ) |

In case of 1 - 4 the adjustment cannot be performed, please solve the problem first.

Subselection display:

- Sub-selection 0 the peak power generated is 300 watts
- Sub-selection 1 the peak power generated is 200 watts

Power is only generated in when a dummy is connected to output channel A.

**Note:** Before performing the power adjustment, first check the battery of the HF. power meter. Connect a (multi) meter to the red and black banana type plugs and check the output power (switch in OFF position). The minimal voltage should be 6 Volt, if not, replace the battery.

#### Power adjustment output stage

- Switch off the Curapuls 670.
- Connect the Curapuls 670 power meter to channel A with a coax cable 50  $\Omega$  length 1.50 m.
- Connect the 50  $\Omega$  dummy to the power meter with a coax cable 50  $\Omega$  length 0.60 m..
- Connect a volt meter to the power meter.

- Remove the connection between TP16 and TP17 and connect an ampère-meter (DC-mode) instead of it, see appendix B, fig.8.
- Place the test jumper at ST4, see appendix B, fig.8.

See appendix B, fig. 8 for lay-out of the adjustment / connection points.

**Warning:** At the mounting base of the power transistors near jumper ST4 voltages up to 400V. are present. Do not touch when the Curapuls 670 is switched on!

- Switch on the Curapuls 670 and select test 38, par. 4.6.4. (see par. 4.3.2 for entering the service mode).
- Choose subselection 0 (300W HF output) and press the start / stop key,

C162 Adjust C162 until the voltmeter gives a maximum reading.

L20 Adjust with L20 until the voltmeter indicates 2.45 volt  $\pm$  0.05 volt.

0.7A Check that the current is less than 0.7 Ampere,

L15 If the current is more than 0.7A, adjust by pressing L15.  
(if this does not work; an alternative can be to compensate with L23). Check if the voltmeter is still at maximum reading.

- press the start / stop key

ST4 Remove the jumper from ST4.

- Choose subselection 1 (200W HF output) and press the start / stop key,

P1 Adjust P1 until the voltmeter reads 2.00 volt  $\pm$  0.1 volt.

0.6A Check that the current is less than 0.6 A.

The calibration of the Curapuls 670 is completed.

#### 4.6.5 Frequency / SWR adjustment Circuplode (Test 39)

- Connect the Circuplode to output channel A
- Select test 39, par. 4.6.3 (see par. 4.3.2 for entering the service mode).
- Adjust the Circuplode until the Result dec. display reads 27.14

For technical information about adjustment of the Circuplode(s) see:

Service manual "**Curamed and Curapuls accessories**" (Part number 1419.781).



## **5 STORAGE AND TRANSPORT**

This chapter contains information about the storage and transport of the Curapuls 670 and the storage conditions for the spare parts.

### **5.1 STORAGE**

The Curapuls 670 and any accessories must always be stored in their original packing.

The long term storage conditions are:

- The unit must be stored at room temperature ( $\pm 20$  °C).
- The relative humidity should be less than 50%.
- The storage room must be clean, dust-free and ventilated.

For the spare parts of the Curapuls 670 the above mentioned requirements also apply.

### **5.2 TRANSPORT**

The Curapuls 670 and any accessories should always be transported in its original packing. This packing withstands normal shocks and vibration caused by transport.

During transport and short term storage the temperature should be between - 40 °C and + 70 °C. The absolute temperature is not too important, however, rapid fluctuations in temperature must be avoided.





## **6 SPARE PARTS**

This chapter deals with placing orders for spare parts (refer to appendix A) as well as the listing of the actual spare parts (appendix A, spare parts list).

### **6.1 ORDERING**

Spare parts can only be ordered if the following data is supplied:

- Part number
- Description
- Quantity
- Shipping details (Incoterms); normal or rapid delivery

The required data is mentioned in appendix A. For the actual spare parts programme please refer to in the spare parts catalogue which is published every year.

Enraf-Nonius only supplies parts mentioned in appendix A. Standard parts such as screws, nuts, cleaning agents and the like are not supplied by Enraf-Nonius; these parts must be purchased locally.

Send your order to your contact person at the sales department of Enraf-Nonius. After receipt of an order you will receive a confirmation. Always check the ordering data.

#### **6.1.1 Normal delivery**

The procedure for 'normal delivery' is the standard procedure for processing your spare parts orders. This procedure is suitable for spare parts orders which do not require rapid delivery such as stock replenishment orders.

If you have an agreement with Enraf-Nonius about fixed delivery dates, the spare parts will be sent together with the next delivery unless otherwise agreed.

#### **6.1.2 Rapid delivery (by DHL-courier)**

If spare parts for an urgent customer repair are not on local stock then rapid delivery can be requested from Enraf-Nonius. The DHL-costs will be charged. Note that rapid delivery is subject to stock availability.

#### **6.1.3 Ordering PC Boards**

Printed circuit boards are only obtainable as spare part in their latest version. Consult the technical documentation for instructions of how to modify the latest version of the PC Board for use in older versions of the apparatus.

### **6.2 WARRANTY CLAIMS**

Warranty claims must be provided with the Enraf-Nonius-invoice number and with the type and serial number of the equipment in question. Enraf-Nonius may ask you to return the (defective) spare parts.

### 6.3 REPAIR SERVICE

Defective PC Boards can be offered to Enraf-Nonius for repair. The repair order can be presented to Enraf-Nonius by means of the "Authorization Request for Return Shipment". Refer to the return shipment procedure as per par. 6.4.

### 6.4 RETURN SHIPMENTS

To return defective equipment and/or spare parts an authorization of Enraf-Nonius is required. To get an authorization use the "Authorization Request for Return Shipment" of which a copy can be found in the Service General Information guide.

The procedure is as follows:

1. Fill in the "Authorization Request for Return Shipment" form and send this form by fax to your agent at Enraf-Nonius
2. Within two working days you will receive the form back again by fax. You will then see that the R(eturn) number has been filled in; this means that your return shipment has been registered by Enraf-Nonius
3. Note this R(eturn) number on the address label. Pack up the goods together with the "Authorization Request for Return Shipment" form (or a photo copy).

After the repair order has been carried out the goods will be returned as soon as possible.

If you have an agreement with Enraf-Nonius about fixed delivery dates, the repaired goods will be send together with the next delivery.

**Note:** When sending the main PC Board to Enraf-Nonius for repair, please use the standard packing in which the replacement PC Board is supplied to avoid damage during transport.

**APPENDIX A SPARE PARTS LIST**

The spare parts list on the next page shows all available spare parts.  
The various columns are explained hereafter:

- Item:           The item number refers to the number on the illustration(s).
- R1:            A number in this column indicates a suggested quantity of spare parts for users (Quantity of equipment in use: 1 - 3).
- R2:            A number in this column indicates the minimum recommended quantity for spare parts stock at the local service organization (Quantity of equipment in use: 1 - 50).
- C:             A "Y"(yes) in this column marks the so-called "Registered" items. The service engineer must record the type and serial number of the spare part as well as type and serial number of the unit in case of replacement.
- Part no.:      The part number column shows the code for ordering the part from Enraf-Nonius.

Description 1: This column gives the general description of the spare part.

Description 2: This column gives the technical specification of the spare part.

**Spare parts list**

Item	C	R1	R2	Part no.	Description1	Description2
001		0	0	2994804	Knob	
002		0	0	2994806	Spacer,	felt, for knob (item 001) 44x3mm
003		0	0	2188076	Castor	
004		0	0	2188077	Castor,	with brake
005		0	0	2570037	Cable,	Coax, BNC-BNC, internal, HF. output
006		1	1	0403801	Test equipment,	Dummy load 50 $\Omega$
007		1	1	0403803	Test equipment,	HF power meter, Curapuls 403/670
BR		0	2	2562121	Rectifier,	bridge
CN		0	2	2523962	Connector,	mains input, fused
CNA/B		0	2	2523910	Connector,	BNC output channel A/B
F		10	10	2655027	Fuse,	F 6.3A, 250V, 5X20mm
F1		10	10	2655175	Fuse,	T 1A, 250V, 5X20mm
F2		10	10	2655180	Fuse,	T 3.15A, 250V, 5X20mm
F3		10	10	2655180	Fuse,	T 3.15A, 250V, 5X20mm
F4		10	10	2655162	Fuse,	T 0.05A, 250V, 5X20mm
F5		10	10	2655151	Fuse,	T 20A, 250V, 6.3X32mm
IC1	Y	0	1	0403704	IC,	EPROM, softw. ver. 4, for main PC Board
IC2	Y	0	1	0403710	IC,	EPROM, softw. ver. 1, for user interface PC Board
LCD		0	1	2562772	Display,	LCD, graphic 240x128 pixels
PCB1	Y	0	2	0403810	PC Board,	main, High Frequency (HF.)
PCB2	Y	0	2	0430800	PC Board,	user interface, incl. LCD back light inverter
PCB3	Y	0	2	2547394	PC Board,	inverter, for LCD back light 5VDC -> 450VAC
S		0	2	2601488	Switch,	mains, 2pole, 16A, 250V
S1		0	2	2600473	Switch,	for user interface PC Board
S2		0	2	2500095	Switch,	encoder. Dig. Cont. for user interface PC Board
TR	Y	0	0	2680844	Transformer,	2x120/12-18.5-18.5-24-160V

## APPENDIX B DRAWINGS

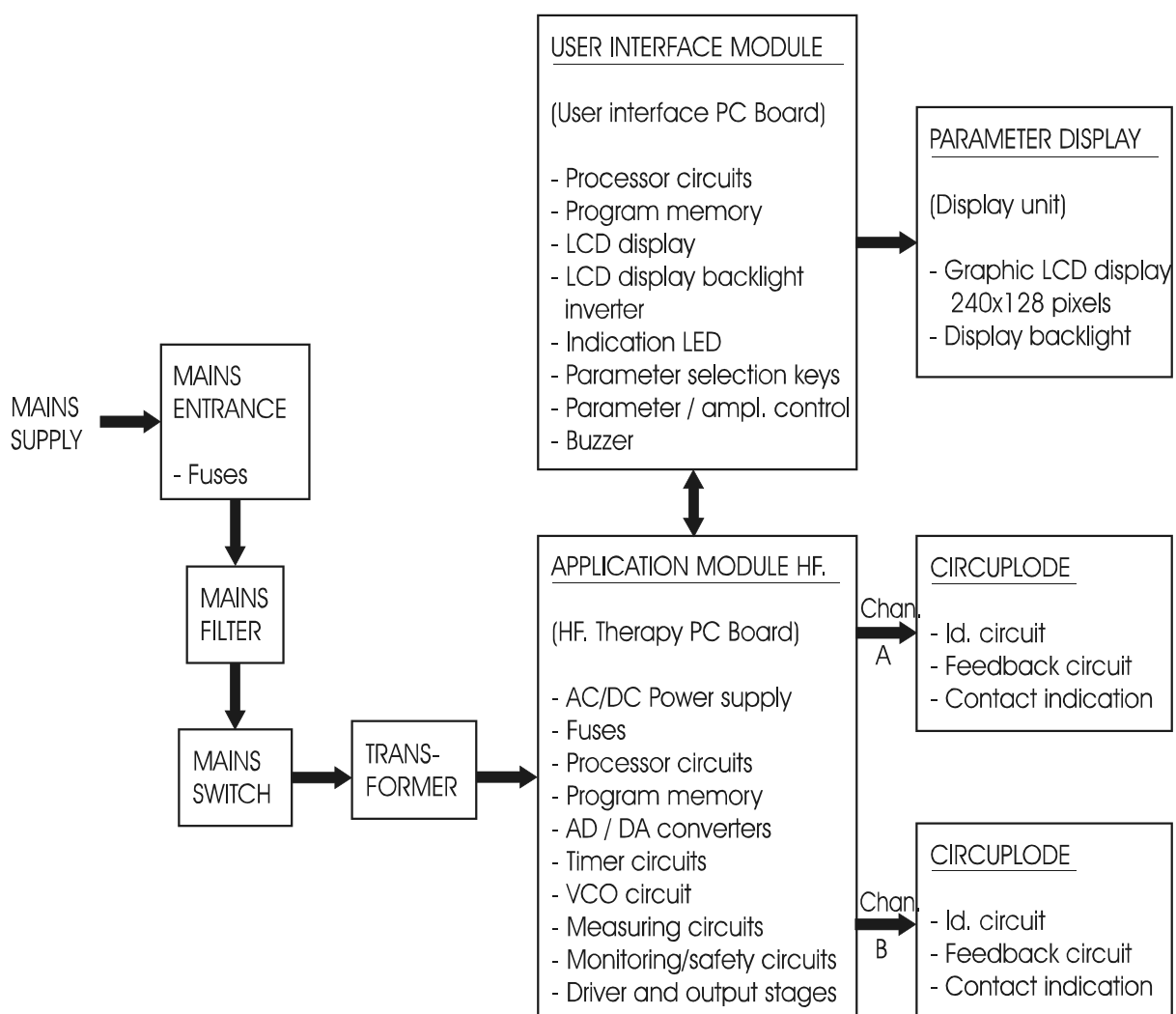


Figure 1 Block diagram

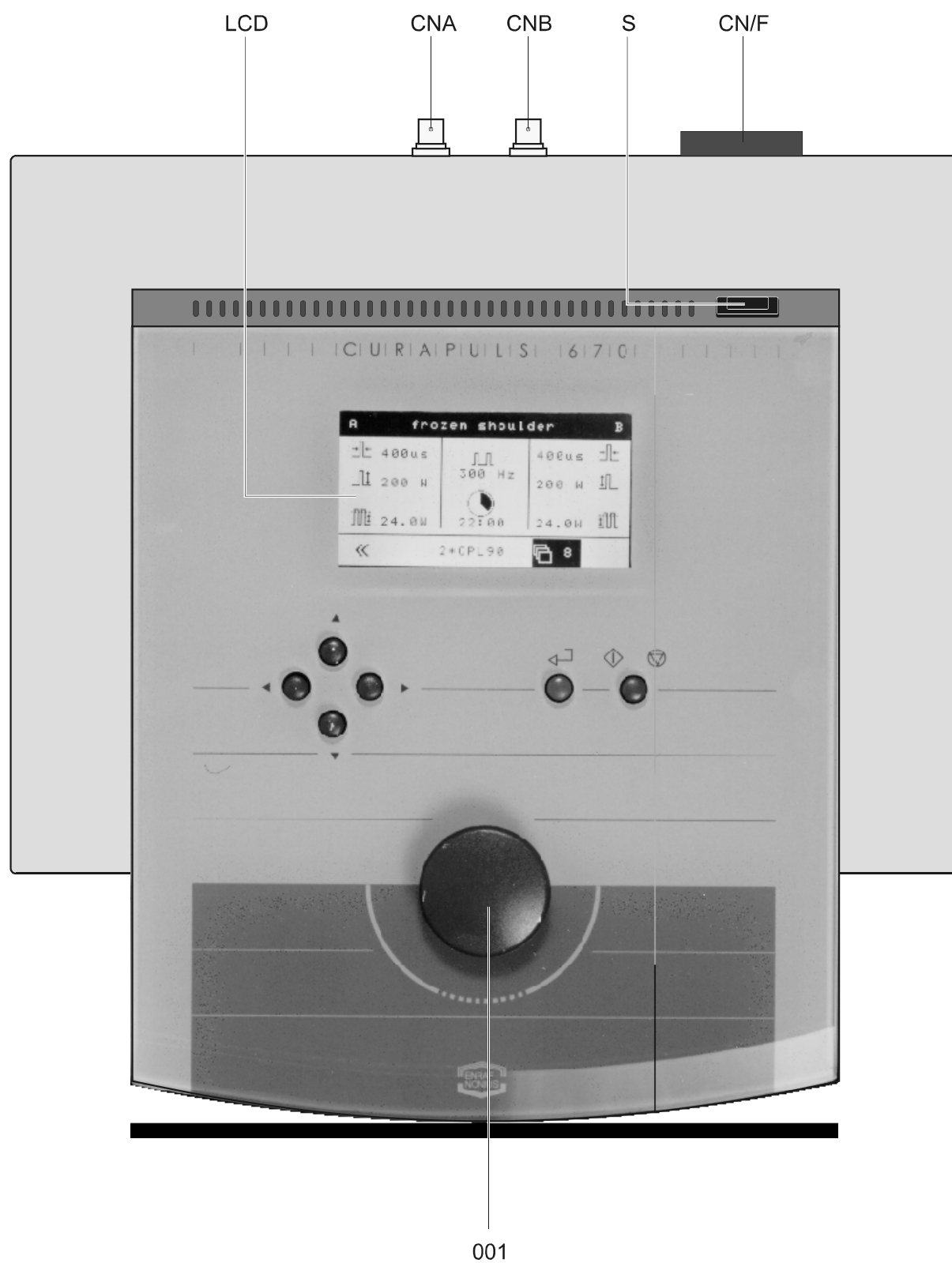
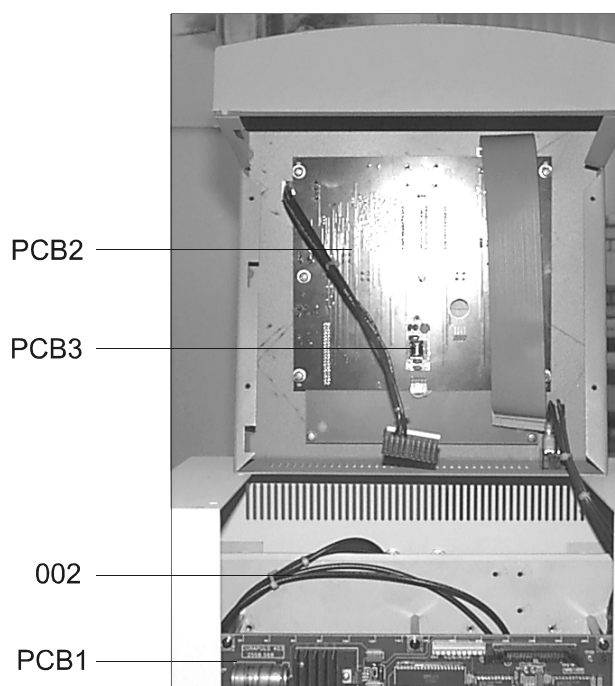


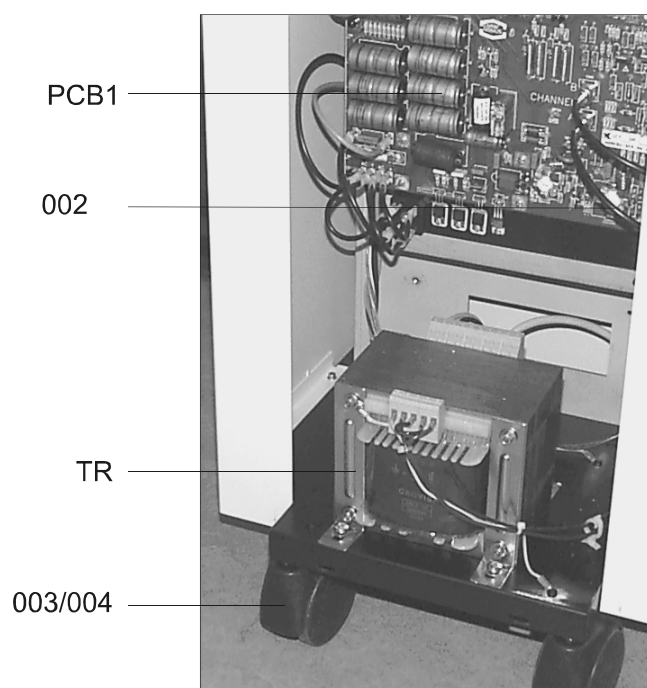
Figure 2 Curapuls 670 top view



*Figure 3*      *Curapuls 670 front view*

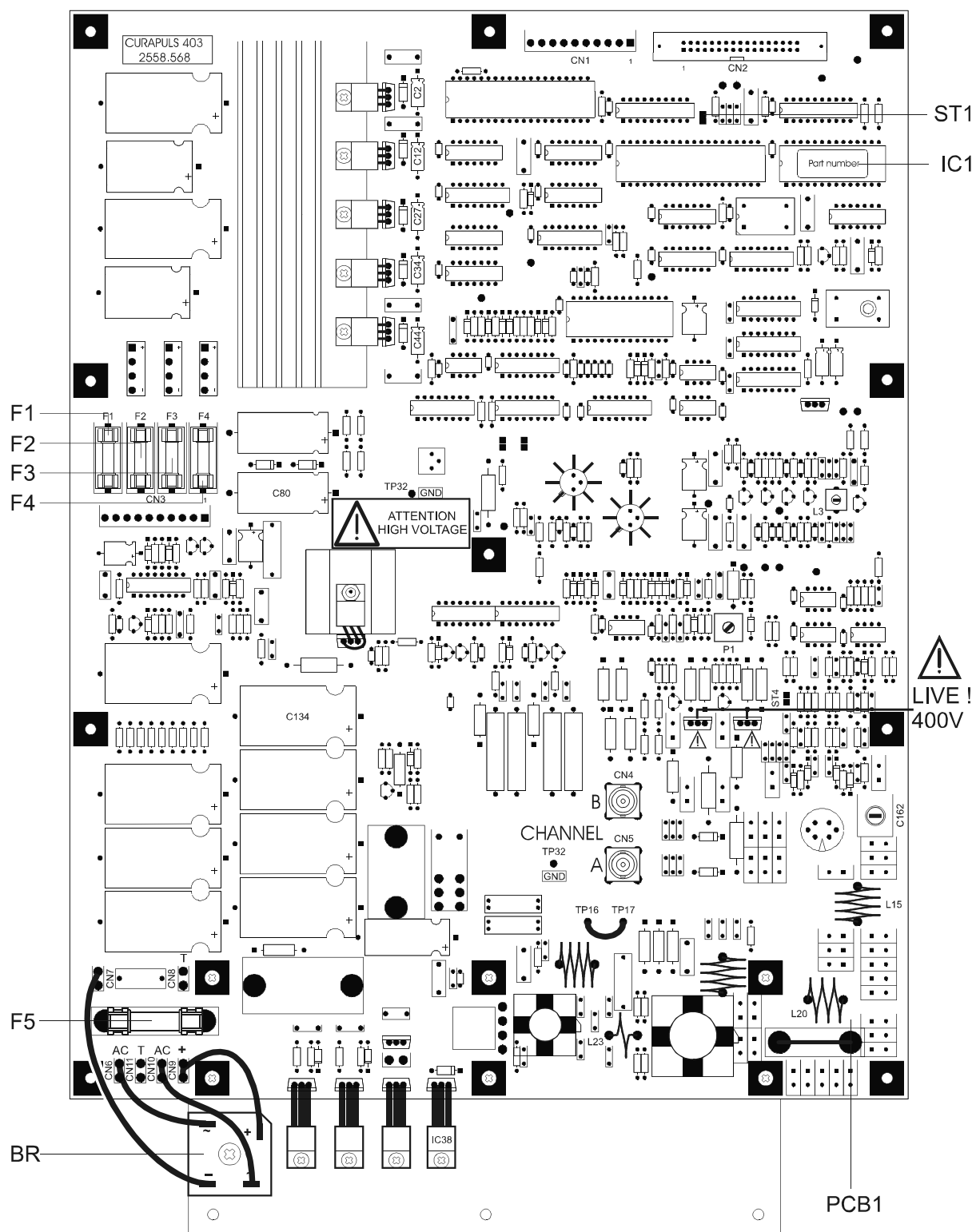


*Figure 4a Chassis front view, top cover*



*Figure 4b Chassis front view, chassis*





Connector:	CN1	CN2	CN3	CN4	CN5	CN6	CN7	CN8	CN9	CN10	CN11
Connected with:	User interface PC Board (CN2)	User interface PC Board (CN1)	Mains transformer	Output HF, channel B	Output HF, channel A	Bridge rectifier (~)	Bridge rectifier (-)	Mains transformer (A)	Bridge rectifier (+)	Bridge rectifier (~)	Mains transformer (B)

Figure 5 Main PC Board, PCB id: 2558.568

## PC Board specification

Product code: 0403680 PC Board, application HF.

### Description

High Frequency (HF.) application module for Curapuls 670 units.

Layers (single/bi/multi): bi-layer

### Product code(s)

0403680 Part no of complete assy (printed on label on PC Board)  
2558568 Part no of PC Board only (printed on PC Board)  
0403810 Equivalent service (spare part) part no (not printed on PC Board; used for ordering only)

### Software

0403703 ID A3 version 03 in EPROM (HF.) for use with Curapuls 403  
0403704 ID A4 version 04 in EPROM (HF.) for use with Curapuls 670

### Service

Circuit adjustments: L3 (frequency), C162, L20, L23, P1 (output stage)  
Serviceable parts for FSE: Fuses F1, F2, F3, F4, F5  
Bridge rectifier BR  
EPROM (IC1)  
Repairable by manufacturer: Yes

### Application / compatibility

Application PB Board used for Curapuls 670 and Curapuls 403 units.

**Note:** The PC Board will be supplied with software, use the software (EPROM IC1) which is specified for the equipment in question (see above). Replace the software if required.  
The software (EPROM IC1) is also available, see spare parts list.

**Note:** Before installation of the PC Board check that the jumper ST1 is removed (Curapuls 670 only), if not, remove it (see PC Board lay-out).

**Note:** When sending the main PC Board to Enraf-Nonius for repair, please use the standard packing in which the replacement PC Board is supplied to avoid damage during transport.

### Notes

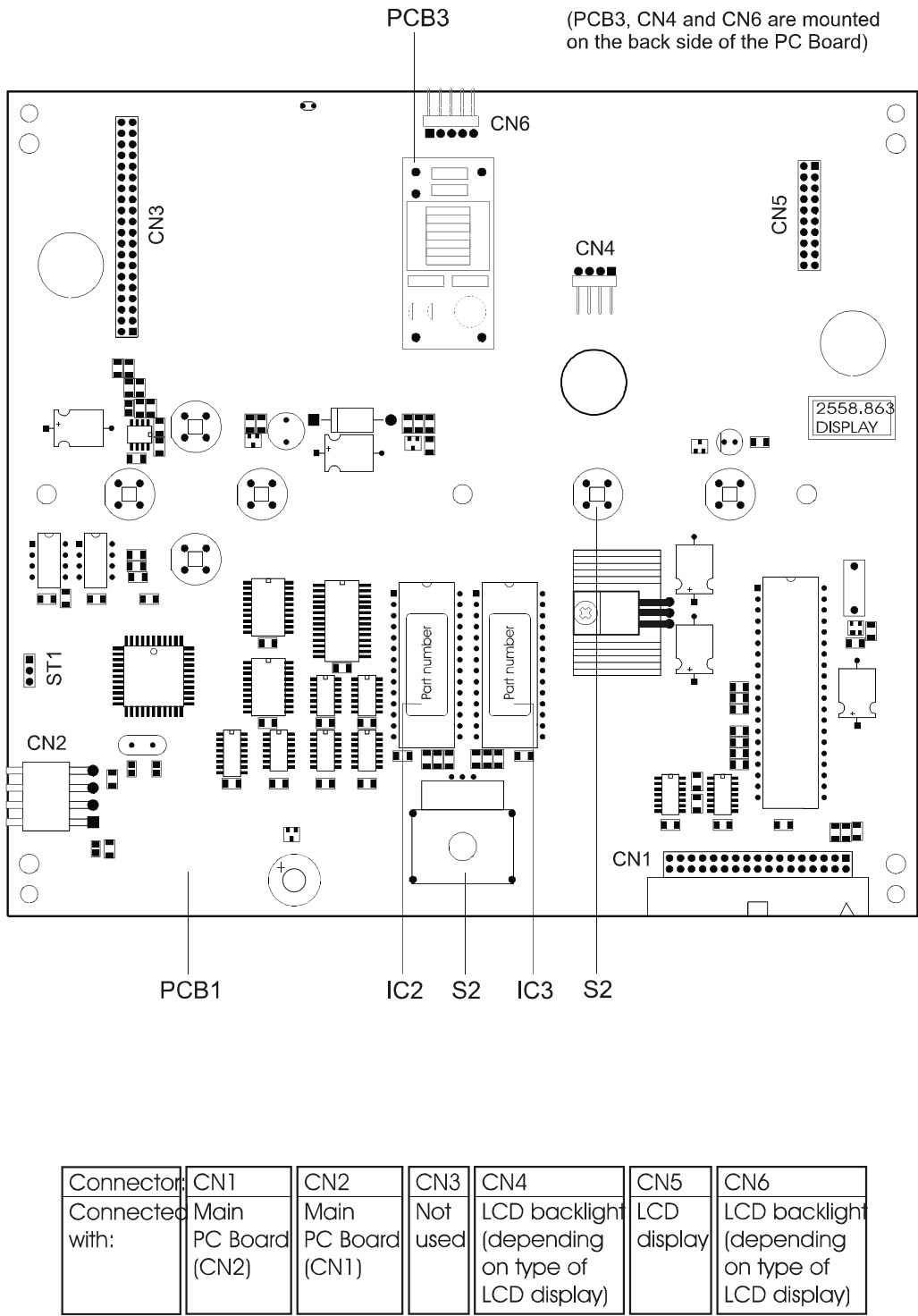


Figure 6 User interface PC Board, PCB id: 2558.863

**PC Board specification**

Product code: 0403760 PC Board, User Interface (Display)

**Description**

User interface module for Curapuls 670units.

Layers (single/bi/multi): bi-layer

**Product code(s)**

0403670 Part no of complete assy (printed on label on PC Board)

2558863 Part no of PC Board only (printed on PC Board)

0403800 Equivalent service (spare part) part no (not printed on PC Board; used for ordering only)

**Software**

0403710 ID 1 version 01 in EPROM (E.T.)

**Service**

Circuit adjustments: No

Serviceable parts for FSE: Switches S1/S2  
EPROM (IC2)

Repairable by manufacturer: Yes

**Application / compatibility**

User Interface PC Board used for Curapuls 670 units with back light LCD display.

**Note:** The PC Board will be supplied without software, use the software (EPROM IC2) which is used on the PC Board which is to be replaced.

**Note:** The PC Board will be shipped without the LCD display but including the LCD display back light supply inverter.

**Notes**

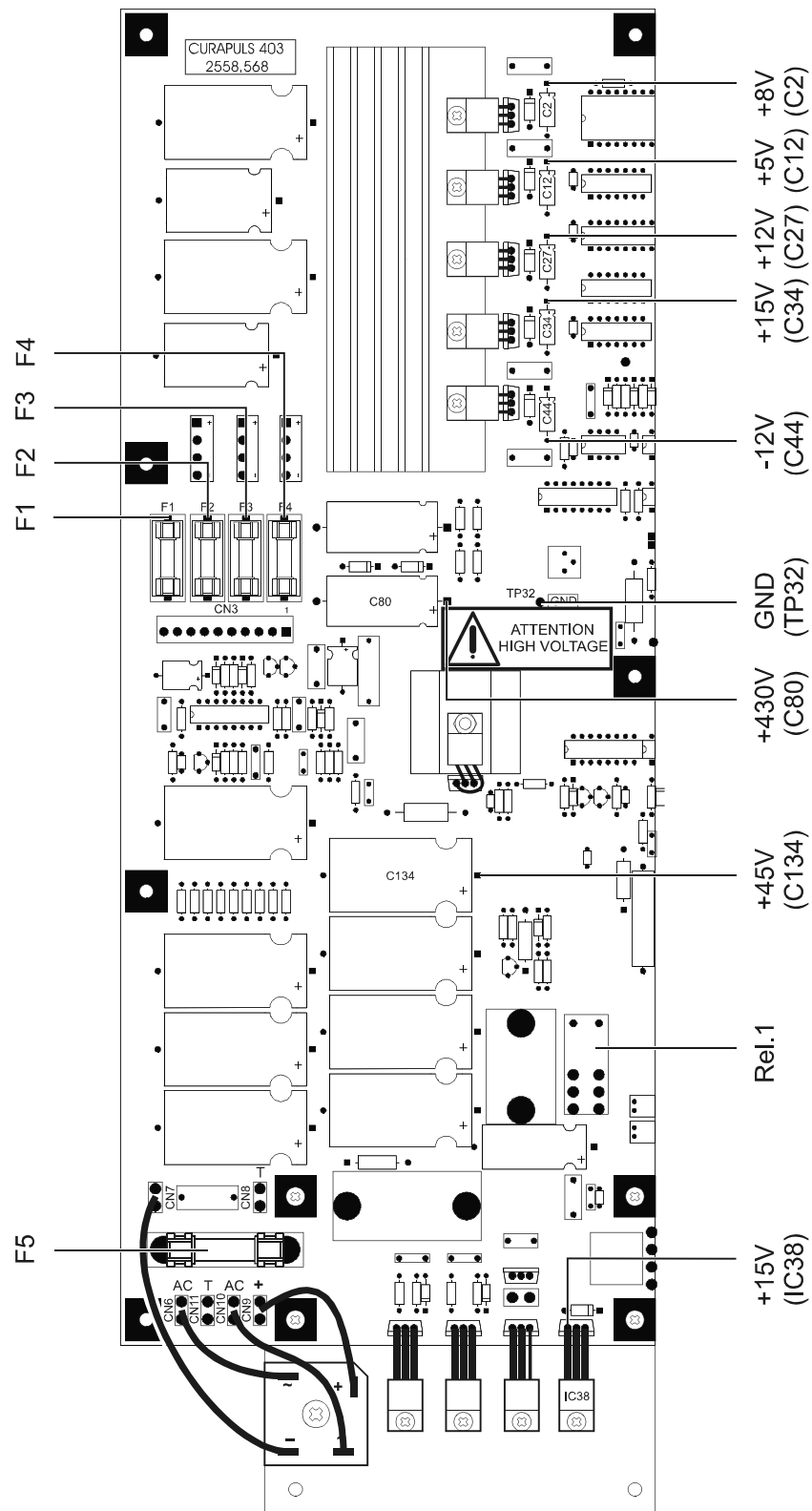


Figure 7 Curapuls 670 power supply check.

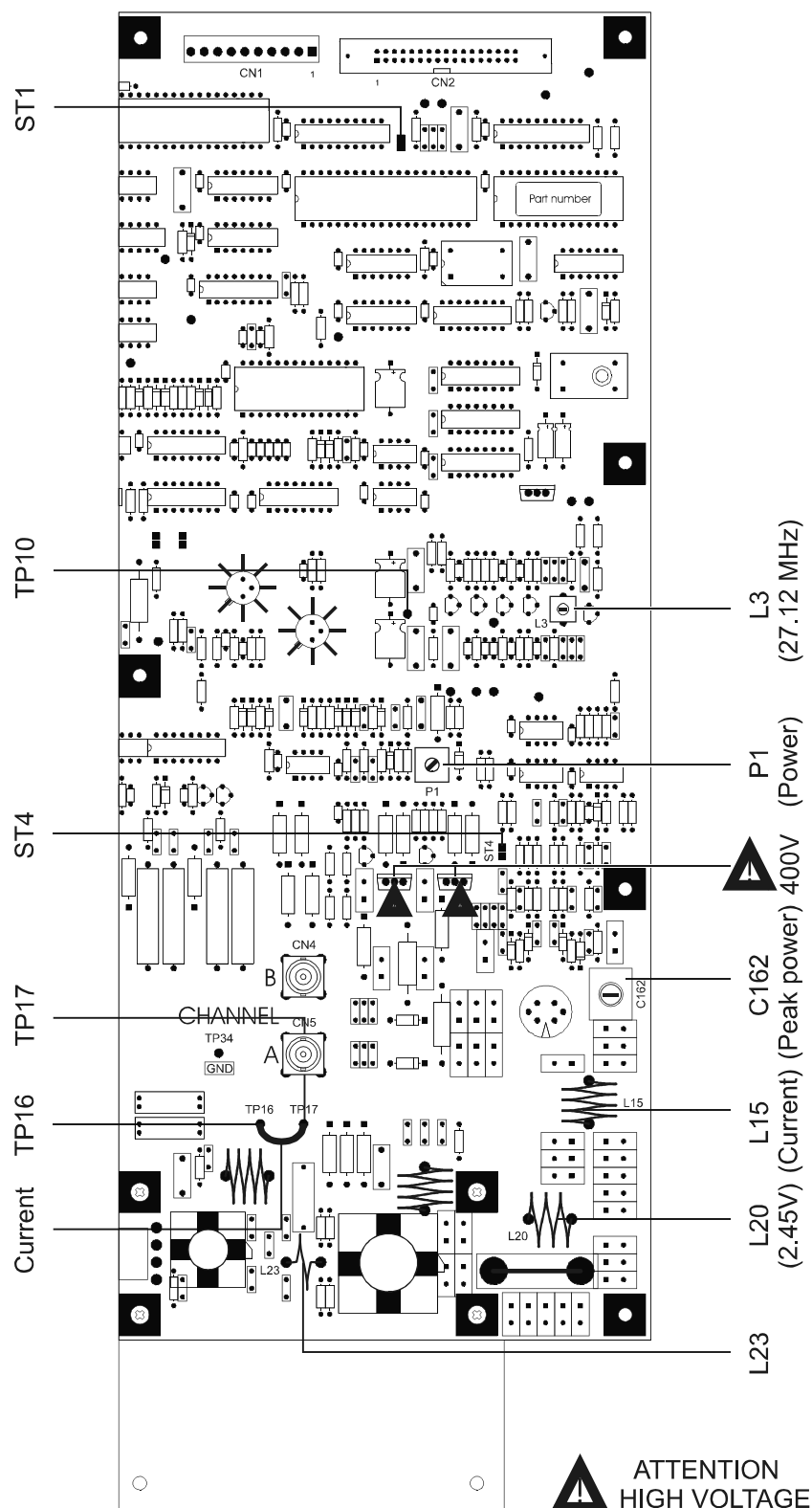
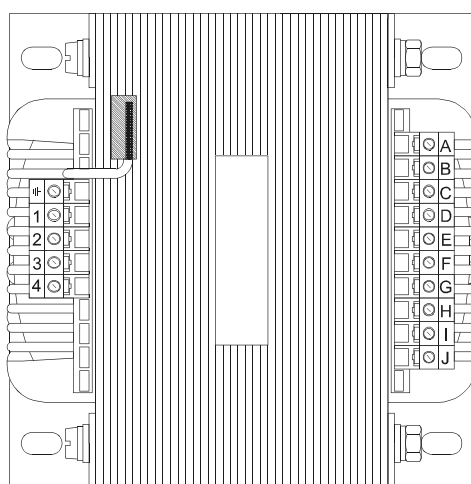
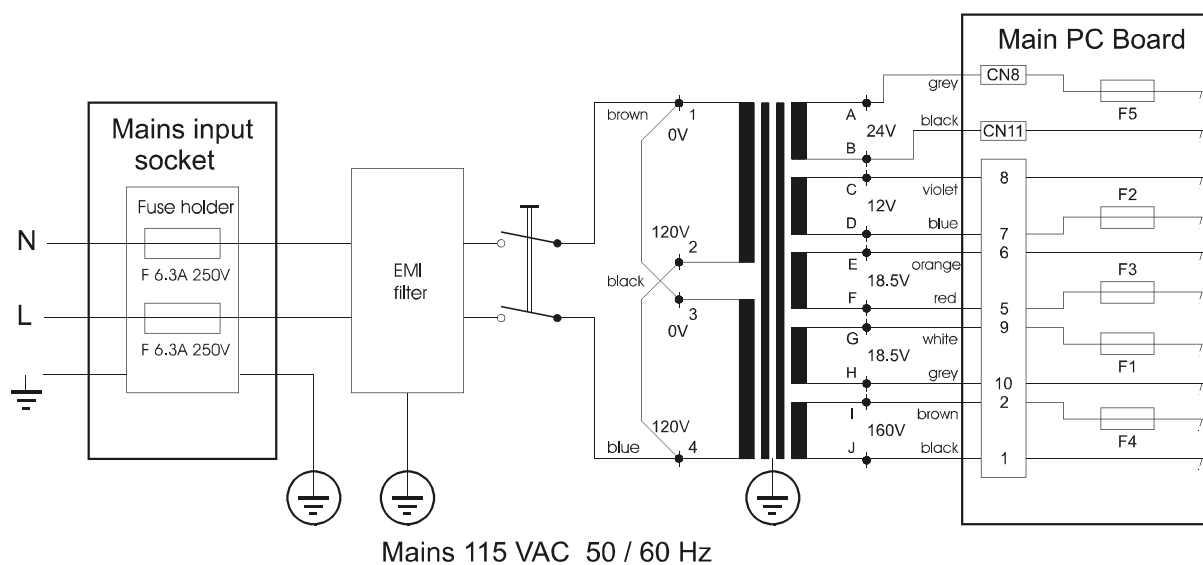
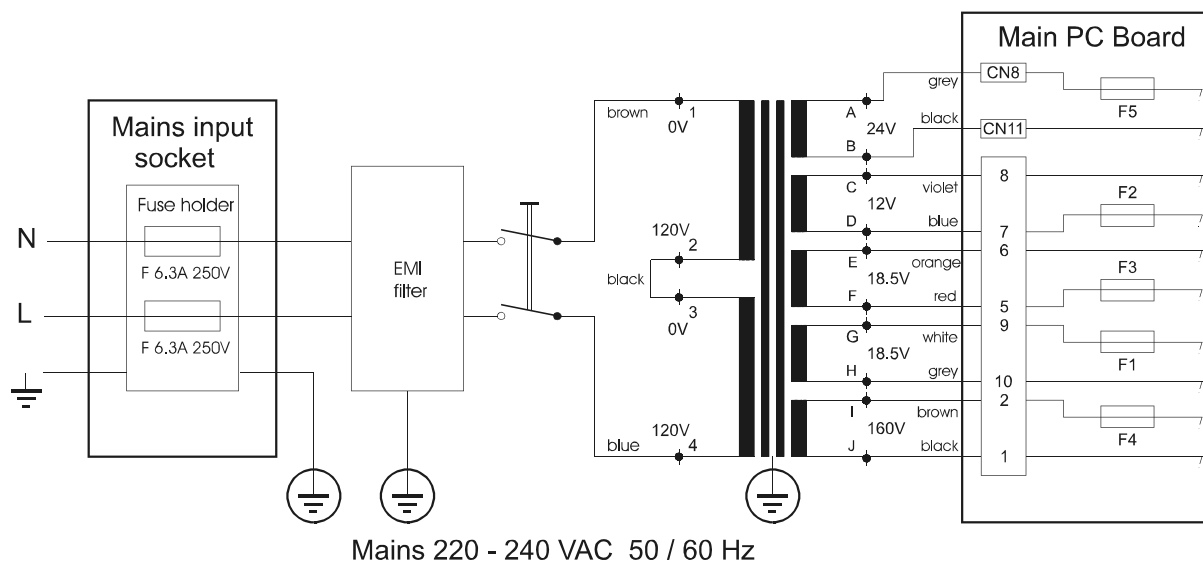


Figure 8

Curapuls 670 adjustment.



Mains transformer

Figure 9 115/220-240 VAC Mains power supply configuration





## APPENDIX C **SERVICE INFO'S (Product Change Notes)**

### C.1 **GENERAL**

The technical information in the service manuals of Enraf-Nonius is up to date from the date of issue.

The necessary additional information (of any kind) will be provided in the following way:

- as supplements to the manual, or
- as revised editions (chapters) of the manual, or
- as Service Info's (product change notes).

Once every year Enraf-Nonius publishes a Service Info which lists all the published Service Info's until sofar.

Once every year Enraf-Nonius publishes a Service Info which lists all the published service manuals. Note that from that moment on these manuals contain all the published Service Info's until sofar. The relevant technical information will then be bind in this appendix.

When a supplement or a revision is made to the manual, a "document history file" is added to this chapter. This file will give information about the date of issue of supplements or revisions.

## C.2 Revision history

First edition:

June 1997

**Revisions:**

Chapter:

Revision:

Date of issue:    page

## Service Information

### Electrode arm, modified adjustment

The electrode arm 3444033 doesn't function correctly with respect to the description given in the accompanying documentation. In the description it is mentioned that the knob(s) needn't be loosened when adjusting the arm.

To modify the function of the arm the three joints with a knob must be altered.

- Remove the arm from the equipment (for the Curapuls 670): do not remove both arms at the same time; otherwise it might not be possible to remount the arms)
- **NOTE:** place the arm on a flat surface with the knobs up to prevent disintegration of the joint and use one hand to keep the joint exactly in place while modifying the joint
- For shoulder and elbow joint:
  1. rotate the knob counter-clockwise and remove the knob
  2. remove the spiderspring and the M10 ring
  3. lift the metal plate with the oblong shaped hole with a magnetic tool
  4. place an extra metal plate (diameter 50mm) from the service set (if in step 9. The outer edge of the knob makes contact with the edge of the arm, an extra plate can be added)
  5. remount the plate with the oblong shaped hole: it must "lock" on the axis of the joint
  6. add the M10 ring from the service set and center it with respect to the axis
  7. place the new knob (with the high ridge) from the service set
  8. rotate the knob clockwise until the knob locks
  9. check the functioning of the joint; when the knob is rotated counter-clockwise (for half a circle) the joint can be easily adjusted; when the knob is rotated clockwise the joint is locked
- For the wrist joint
  1. rotate the knob counter-clockwise and remove the knob
  2. place the new knob (with the low ridge) from the service set
  3. rotate the knob clockwise until the friction of the joint is enough to support the weight of an applicator
- Remount the arm
- Replace the manual 0169.285-41 with the new manual 0169.285-42.

When needed, the friction of the cabinet hinge can be adjusted by rotating the bolt(s) of the hinge. The bolts can be accessed by removing the plastic covers.

Please add this service info to appendix C of your service manual.

## Change classification

- ☐ Perform immediately on all field units.
- ☒ Perform routinely at next service call.
- ☐ Perform only upon unit failure.
- ☐ Information only

Commencing date: October 31, 1997  
Carried out from series: Curapuls 670 - 01001; Curapuls 970 - 01001  
New components: 0431.804 (service set)  
Deleted components: three knobs, two spider springs, two M10 rings, manual  
0169.285-41  
Our reference:



## Service Information

### Curapuls 670, changes main PC Board.

The heatsink at the bottom side of the main PC Board of the Curapuls 670 has been changed. The PC Board will be shipped completely mounted and wired.

Because of the changes, the replacement of the main PC Board is changed. When replacing the main PC Board with a "new type" the following procedure should be followed:

(Also see the service manual chapter 4.5.4)

### Main PC Board

**Removal:** See par. 4.5.2 of the service manual for removal of the front cover. Disconnect the cables from output channels A (CN5) and B (CN4) and from connectors CN1, CN2, CN3, CN8 and CN11. Remove the 12 mounting screws. Remove the main PC Board from the housing. Remove the 10 spacers (M4 x 80mm) from the mounting chassis inside the housing of the unit.

**Installation:** Mount 10 new spacers (M4 x 33mm) in the mounting chassis inside the unit. Remove the protective plate at the component side of the main PC Board, also remove the mounting plate (2 screws M4 x 50 and 3 screws M4 x 8mm) which is mounted on the heatsink of the main PC Board. Mount the heatsink/main PC Board assembly to the mounting chassis inside the unit with 10 screws left over from the removal of the main PC Board. Mount the heatsink to the mounting chassis with 2 large screws (M4 x 40). Installation of the main PC Board is in reverse order of the removal procedure.

**Caution:** Check that all fuses have the correct value (see par. 1.3.1 of the service manual).

**Note:** Check when mounting the main PC Board for the right version software (version 4, part number 0403.704 or above) of EPROM IC1, see appendix B, fig. 5 (service manual).

**Note:** When inserting the EPROM with the application software into the socket, the PC Board must be supported to ensure that no components will be damaged by mechanical force.

**Note:** Check that jumper ST1 is removed.

Please add this service info to appendix C of your service manual.

### **Change classification**

- ☐ Perform immediately on all field units.
- ☐ Perform routinely at next service call.
- ☐ Perform only upon unit failure.
- ☒ Information only

Commencing date:	July 1998
Carried out from series:	11.000
New components:	NA.
Deleted components:	NA.
Our reference: :	WV 1403.000-61/18

## Service Information

### Curapuls 670, Preventive spraying of the main PC Board

To prevent high voltage break-down due to slowly increasing the mains voltage from 220VAC -> 230VAC last years, it is recommended to put an insulation lacquer on the rear (solder) side of the main PC Board. The small clearance between a few high voltage (approx. 400V with respect to ground) solder pads an the ground plane could cause a spark jump.

An anti-corona lacquer is available to prevent this problem.

The marked area in the drawing has to be treated with this lacquer.

Ordering information:

ANTI-corona spray,

EN. part number: 4120.018

Description:

RS COMPONENTS

part number: 569-313

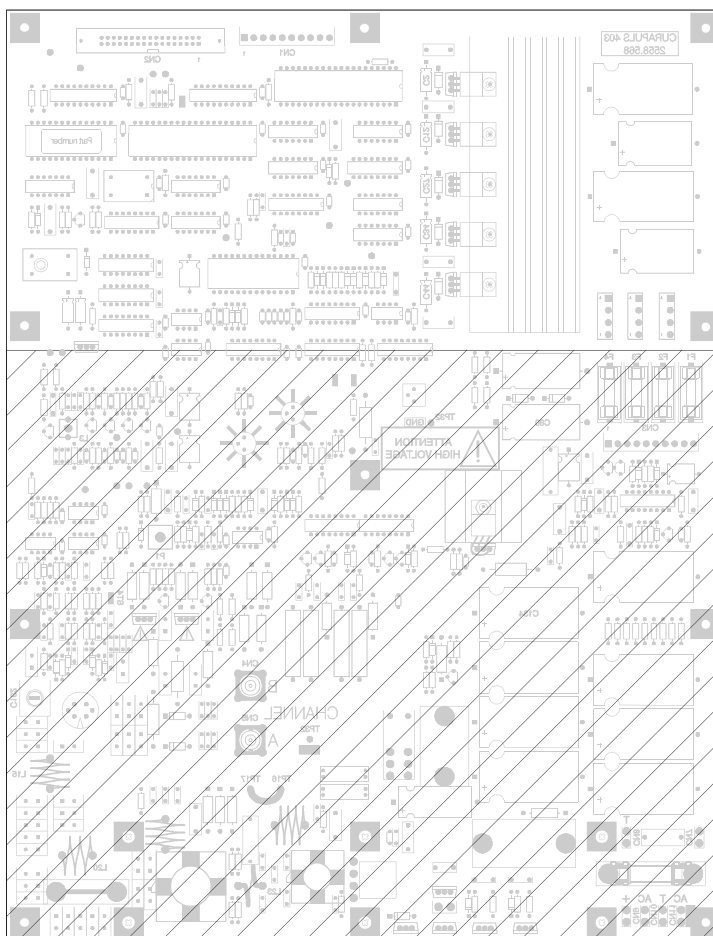
Anti-corona lacquer clear, pliable, moisture repellent lacquer designed to reduce surface tracking and corona in EHT circuitry.

Suitable for assembled PCB's, transformer windings and component protection.

Dielectric strength: 48 kV / mm  
Temperature range: - 20 to + 150 °C  
Package: 400 ml aerosol

**Warning:** Flammable propellant

Please add this service info to appendix C of your service manual.



### Change classification

- ☐ Perform immediately on all field units.
- ☐ Perform routinely at next service call.
- ☐ Perform only upon unit failure.
- ☒ Information only

Commencing date: July 1998  
Carried out from series: NA  
New components: 4120018 Anti-corona spray  
Deleted components: NA  
Our reference: WV0403680-74/01/02





## Service Information

### Curapuls 670, Heat sink mounting.

This service information sheet describes how to improve the thermal contact of the main PC Board heatsink to the chassis of the Curapuls 670.

The new type main PC Board (see also service information sheet SI 670 - 02) is equipped with an heatsink which is directly mounted to the chassis of the unit.

The mounting of the main PC Board has been changed, the mounting hole in the heatsink at position "A" is drilled through the heatsink.

Previous versions of the main PC Board are equipped with an mounting hole with internal M4 thread.

To improve the thermal contact the following modification is suggested:

- When replacing a (defective) main PC Board, the replacement Board must be mounted by means of an longer screw, item "A" (M4 x 50 mm), to the chassis of the unit (see figure 1 at the other side of this service information sheet).
- Check the chassis before mounting the PC Board that a hole is drilled into the chassis at position "A", see figure 1.
- If there is no hole in the chassis at position "A", drill a hole with a diameter of 4.5 mm. into the chassis. (use the PC Board heatsink as a reference).

**Caution:** Make sure that no metal particles, caused by the drilling, will fall into the PC Board or inside the housing. This could cause a short circuit.

- Mount the main PC Board to the chassis. Mount the heatsink firmly to the chassis with the M4 x 50 mm. screw at position "A".

The modification can also be made to an installed main PC Board to improve the thermal contact.

- Remove the mounting screw "A" (M4 x 10 mm.) and drill a hole through the heatsink and the chassis.
- Mount the heatsink firmly to the chassis with the M4 x 50 mm. screw at position "A".

Please add this service info to appendix C of your service manual.

### Change classification

- ☐ Perform immediately on all field units.
- ☐ Perform routinely at next service call.
- ☐ Perform only upon unit failure.
- ☒ Information only

Commencing date:	NA	
Carried out from series:	NA.	
New components:	Screw M4 x 50 mm.	Qty. 1
	Washer M4	Qty. 2
	Spring washer M4	Qty. 1
Deleted components:	NA	
Our reference:	WV 0167.113-70/02	

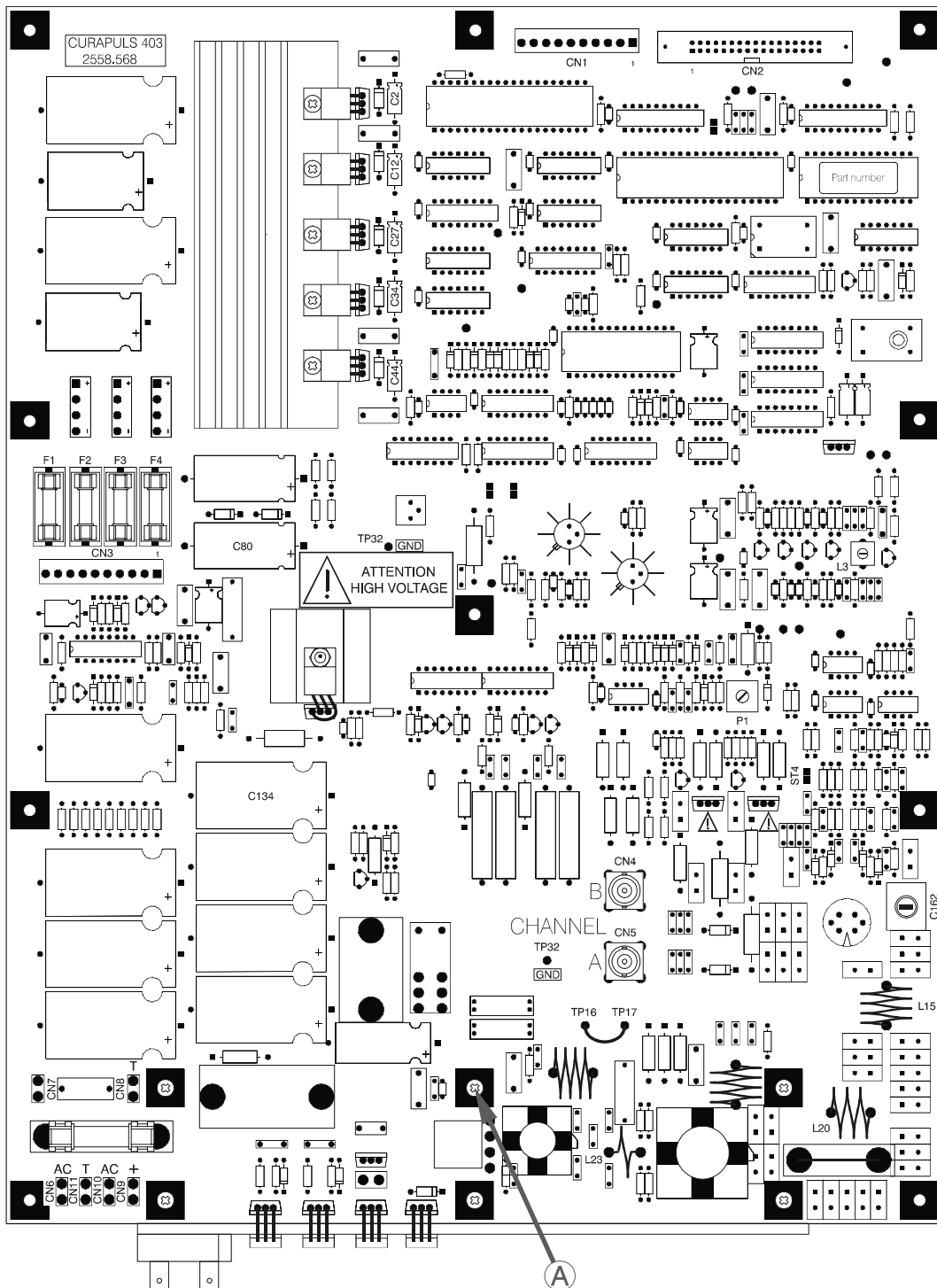


Figure 1 Detail of the main PC Board





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